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ABSTRACT

Developed to explore how individuals receive and process sensory information, this paper describes a curriculum designed for elementary students concerning the brain and information processing. The course is entitled "Mind Adventuring: Learning about How We Learn" and is structured into eight units of study. Descriptive accounts are provided for each unit and suggestions for instruction are stated. The units focus on: (1) intelligence and creativity; (2) brain structure and function; (3) five senses and brain integration; (4) art and science of perception; (5) language; (6) reading; (7) field trip; and (8) a brain-drain fair for school and parents. Sample activities and student exercises are provided. (ML)

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LEARNING: HOW THE BRAIN ACQUIRES INFORMATION

There is an element which is so basic to success in school and later life that it is the one most overlooked, or simply taken for granted. That is, how do we as individuals receive and process sensory information; or, how do we learn? This is a sizeable inquiry. However, an awareness of how we learn as individuals opens up a multitude of "doors" in terms of going beyond the original learning situation for all learners.

With this in mind, I thought it might be fun to put together a curriculum for elementary-school aged children concerning the brain and information processing. The course approach is intended to be in line with current mind-brain research, and thus is creative and wholistic. It is structured for a typical fourth grade classroom, perhaps 30-35 students about nine or ten years old. There are special, regular,and gifted education students. There would also be parent volunteers and a teacher aide or two as available. I must emphasize that this course is merely a blueprint for action, and is intentionally incomplete. Teachers and educators are encouraged to enlarge upon what is presented using their own creativity and ideas. Everyone should experience a growth as a result of this school-based undertaking.

The course is entitled, "Mind Adventuring: Learning About How We Learn." There is no fixed time period, and material has been organized into units for

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presentation. Let me quickly add that this is not intended to be the ideal fourth grade curriculum because I am not a trained teacher; this is merely a blueprint for action.

Take a deep breath as we enter into the realms of our minds.....

One week before the course is scheduled to begin, the teacher does some stage-setting. Students are asked to collect, or be on the lookout for, articles, books, reports, films, television programs, lectures, comic strips, etc. , that relates to INTELLIGENCE, CREATIVITY, LEARNING, the BRAIN. They will be given folders to collect their research in. Secondly, students will be asked to ease themselves into the mindset of thinking, or reflecting upon how we learn, how they learn as individuals; to think about intelligence and creativity and formulate some ideas as to what these are.

The day before the course starts, we talk about a 'cooperative learning environment' followed by our doing and participating in one. We adapt an operational code such as students will write their names in a designated area on the blackboard if they need help, wish to leave the room, etc. This code will be modified as needed if it doesn't work out. I will explain about the presence of learning, resource, and media centers in the class; individual, small group, and classroom learning activities; no textbooks or workbooks, etc. The "face" of our normal classroom is about to change. Students get up and push their desks over to one side. Out come throw pillows, beanbag chairs, afghans, etc. Bowls with raisins, nuts, sunflower seeds are spread around. There are several pitchers of fruit juices. The students seat themselves comfortably on the floor (hopefully, carpeted), and are directed to shake out their limbs and get their blood flowing. This will be our laboratory for learning, experimenting, and adventuring in.

The students are given course outlines so they have some idea as to what to expect, and can generate some excitement:

"Mind-Adventuring: Learning About How We Learn"

UNIT #1: Let's Talk About Intelligence and Creativity -- What Are They?

Guest Speaker - Prim, fashion designer

UNIT #2: What do our Brains Look Like, and How do They Work?

- Surprise -

UNIT #3: The Five Senses - Our Gateway to the World

What, then, is Learning? Brain Integration

UNIT #4: The Art and Science of Perception

A. How do We See? Guest Speaker - Julie, who is blind, and how she sees.

B. How do We Hear? Guest Speaker - Warren, chemist, and vibration analysis.

UNIT #5: "Use It or Lose It" or, What is Language all About?

Guest Speaker - Heidi, polylinguist

UNIT #6: What Goes into Reading?

UNIT #7: Field Research Day - AM, Pacific Science Center - exhibit on creativity
PM, Federal Way Convalescent Center

UNIT #8: Brain-Drain Fair for School and Parents followed by class pizza party.

The students already know there is no textbook, and are told that we will be writing and creating our own textbook as we go along. They have their "data-collection" research folders.

There will be several ongoing projects:

a. Mind journal or dream journal - students are asked to make at least one entry per evening in their private journals, can be anything relating to overall theme and can take any media form (picture, collage, quote, story, poem, song, a creation, skit, floor-plan...whatever); in the dream journal students are instructed to keep a pad and pen by their beds and to record their dreams. Students may do either journal option, or alternate between the two.

b. Class literary magazine - each student will submit to our student editorial committee as many entries as they like, the committee will choose one selection per student-compile- and produce a classroom literary magazine copy for all class members.

c. Class scholarly journal - instead of (b) students may wish to submit brief essays on issues related to general theme for inclusion in a class-produced "Journal of Learning: or "The Journal of Intelligence and Creativity," etc.

d. Brain-Drain Fair exhibits and demonstrations - students need to commit as soon as possible, and they can then direct their independent coursework to completing Brain-Drain projects. There should be a handout explaining the fair and learning activities. An example follows - - page 5.

The students will be given feedback forms at the end of every class to express how they are feeling about the course, what they like and dislike, suggestions, modifications, deletions, etc.

WELCOME TO "MIND-ADVENTURING" OR LEARNING ABOUT HOW WE LEARN

Our final project is going to be a 'BRAIN-DRAIN' fair that we will stage for the school and your parents (brothers and sisters, even grandma and grandpa can come too!) on DATE.

Be thinking about WHAT you would like to do, and WITH WHOM you would like to work with. You can do as many things as you like. Show off your talents, creativity, and pizazzzz....

Here are some ideas and suggestions (remember, it's usually more fun when you come up with your own ideas).

* a three-dimensional model of the brain
* a bas-relief or regular brain-map
* around-the-room mural on perception, reading, language acquisition
* a photography exhibit
* a bulletin board on intelligence and creativity
* a learning center on optical illusions
* individual reports that will be displayed in our class library
* models of perception (visual, auditory, tactile, olfactory, taste)
* demonstrating visual-auditory-motor measures
* role-playing or dialogues or short skits on selected topics
* a videotape
* a panel discussion - either students participate or arrange for guest panelists
* a debate or a game show reinactment

We also need a group of students who will participate in the fair-planning executive committee. Includes making arrangements for the pizza party!

The class will understand that their final projects and course evaluations are due on the last day of the course which is "BRAIN-DRAIN" day. Course evaluations and self evaluations will be handed out prior to the final day, and each teacher/class should design their own. There will be no grading during the course, but students will receive feedback on their work and progress. *Students will not be checked out for completed assignments, but it is expected that they will participate; pace their learning; make intelligent choices based upon how

they learn best and complete a final project for our fair. They are expected to either verbally state, or have in written form, an individualized learning profile at the end of the course. *Naturally, there should be sufficient support staff (aides and volunteers, interns, parents, etc.) to facilitate helping each child work towards increasing independence and solid decision-making. Otherwise, this course falls flat on its face! Assuming that a letter grade will have to be assigned, this should be a joint-evaluative venture between teacher(s) and student.

As a preparatory exercise, students are now asked to reflect upon (1) INTELLIGENCE and (2) CREATIVITY (for a few minutes) and (1) write down all those things that immediately pop into their minds [guided brain-storming] and (2) then write a few sentences describing their ideas and thoughts about Intelligence and Creativity. Their reflections will be collected, compiled, and presented at the beginning of the class. This will introduce us to:

"MIND-ADVENTURING"

Home Activities: (1) At least one entry in mind or dream journals, (2) continue data-collections with research manila envelope, (3) thing about BRAIN-DRAIN project and literary magazine submissions (just think, no doing), (4) look over handouts on brain structure (teachers-remember to hand these out!), (5) think "BRAIN" and talk about it with friends and family - you'll impress them.

Today is the first day of the course. By way of introduction, we will do some exercises in creativity such as cross-sensing (tasting Tuesday, smelling blue, etc.) imaging to a musical selection, free-association word pairs, riddles or brain-teasers, etc. This should get the class in a creative mood. After some brief limb-stretching, I will present the different ideas and concepts re: intelligence and creativity, and I will write this on a huge poster board which will remain posted throughout the course. We will then have a class discussion bringing

in the students ideas AND the ideas that have been presented in the articles and such they have been collecting. [NOTE: homework assignment tonight is to make up a quiz on one piece of literature they have collected , tomorrow students will switch quizes and work on answering questions in small groups of two's or four's]. I will play devil's advocate and present the views of Piaget, a developmental psychologist, and Ulric Neisser, a cognitive psychologist (Psychology Today, May 1983, "A Conversation with Ulric Neisser"). We'll talk about Piaget's stages of learning (see attached handout), Neisser's outlook on IQ measure and school, and Sir Cyril Burt's views on IQ and race ("British Psychologist Was a Knight, A Genius, Influential, and a Fraud," Spectator, December 1978). This should spur some lively discussion about the limitations of testing; how intelligence transcends a testing situation, and how the definition of intelligence and the labeling of success can have sociopolitical and economic underpinnings. The point of this lesson is to emphasize the beauty of individual differences and the incredible creative potential within all of us that is our intelligence; that we can and should be all that we can be because each of us has it all (lead into later discussion of Karl Pribam's hologram theory). We will conclude by taking a sample intelligence test, evaluating how we did, critiquing the test, and seeing how we could devise a better test. [NOTE: interested sudents may design their own intelligence tests as a substitute homework assignment, or journal entry, or longer-termed project for "BRAIN-DRAIN"].

It should be lunch time about now-maybe dinner time! When we reconvene, we are introduced to a Thai friend of mine, Prim, who was a London fashion designer. She will illustrate how her creativity and intelligence interact to produce beautiful styles and patterns of clothing. The students will have a chance to try their hands at designing a fashion.

Homework Assignments: (1) prepare a quiz or intelligence test sample, (2) at least one journal entry, (3) keep thinking about BRAIN-DRAIN project, (4) take time to think about what we did today in class, talk about it to others, (5) review handouts on brain structure, (6) do anything you want to do not mentioned that you are interested in relating to the course.

Two other daily events will include a "vocabulary tree" where we hang and add a new word on an ex-Christmas tree in the corner, AND a newscaster report on mind-brain current events from data-collection files (students take turns).

This Day is #2 or Unit #2. We'll start off with _student's name_ Reports Live from _classroom or school location_ and hear about some current research or data! Next we hand a vocabulary word on the tree. Then there are small groups who work on quiz and/or intelligence tests exchanges. But what is the surprise, someone asks. Okay, okay, get on walking shoes and turn on all sensory processing machinery upstairs. We are walking over to nearby university/community college where a nice young resident neuropsychologist will talk about the brain and how it is "made" to acquire learning (too-o-o convenient, I know!). We will look at the brain models AND embalmed brains on display, and we will examine the handouts on the physiology and anatomy involved in sensory (visual, auditory, etc.) processing. Question and answer period followed by lunch on a lawn, or in school cafeteria.

Following lunch, I will do a didactic presentation on "Specializations of the Human Brain" (_Scientific American_, September 1979, Norman Greschwind). We will start off by identifying what neurons, axons, dendrites, synapses, nerve cells are. We will then talk about right and left hemispheres and what specific activities are associated with each. We will take a look at Broca's

and Wenicke's areas to understand a bit about the comprehension of language and production of speech. We will touch upon cases of brain injury and how the brain compensates or adapts to the loss of some of its functioning units, i.e., brain plasticity. We will also look at the phenomenon of dyslexia and the abnormal cellular structure in the brain. We can then entertain some "how cum (How come)?" questions and answers, or how does a negative-to-survival condition not get selected out through the life species generations (an explanation about natural selection will be needed first)? We shall conclude this presentation with the following handout which will stress brain integration through analogy.

Homework Assignments: (1) Vocabulary tree and live reports, (2) journal entry, (3) tomorrow we commit to a Brain-Drain project (expanded work on bas-relief brain models, diagrams of speech production and language carticulation, demonstrations of brain injury/recovery/compensation such as with stroke victims, an exhibit on what areas of brain control what areas and functions, dialogue between left and right brain hemispheres, etc.), (4) think about how our brains acquire information, then talk about it.

This is Day #3 or Unit #3: The Five Senses-Gateway to the World.

We start off with our vocabulary tree-hanging exercise followed by a student "live report." The studentsare then asked to write down some of their thoughts concerning BRAIN-DRAIN projects. Next is a "blizzard of paper" or a group of handouts. We put the handouts under something for now. Students are placed in groups of 4 or 5, assignment is to reinact either 1) the model of brain functioning as described by Joseph Chilton Pearce in Magical Child, or 2) make up their own model and reinact that.

The teachers can approach this unit from a wide variety of prespectives and activities. What follows is a list of suggested activities and exercises as a springboard for individualized adaptation to specific classrooms.

Along the societal dimension, you can arrange a field trip or volunteer experience that will permit the students to interact in the community. Unit #7- Field Research Day - has the students visiting a convalescent home and doing some research on brain injury-recovery-compensation.

For the intuitive dimension, it would be fun to have a detective or investigator kind of person come in as a guest speaker and address how their "hunches" aid them in their work and work-related safety. In addition, there are Guided Fantasy Journeys (pretend you are going through time and space from 1800 to present time, pretend you are a nerve cell traveling through the body, pretend you are a spool of thread being used to make a coat, etc.); Dream Journal(recording dream imagery-events-feelings →no interpretation!) →can be used as a basis for an art project, creative writing, research, self-understanding; Creativy Exercises (cross-sensing, brain-storming, poetry-writing in shapes --> examples follow:

1. What does it feel like to be a misspelled word? empty paper bag? crushed up milk carton? a new book? an old proverb? musical note? striped piece of fruit-flavored gum?
2. What number represents you? is happy? is sad? parental? dry? sweaty? snobbish? timid?
3. List of all things that come in pairs?
4. Make up a list of distantly related wordpairs →ask students to supply a third word to relate the first two.
5. Trash archeology - collect waste from at least three locations at the end of the day; reconstruct the day's events noting approximate times, events, possible antecedent and outcomes.

6. Writing poetry "Apollinaire" or the poetry lines assume the shape of its subject.

For the affective dimension, the teacher may consult values clarification and self-esteem building ideas' manuals. A self-advertisement exercise is fun where students are presented with dimensions (physical, intellectual, emotional, social, moral/spiritual), and are asked to draw or create an advertisement of themselves keeping the dimensions in mind. Another exercise is filling out a personal resume which lists successes/achievements/accomplishments from 0-5 years and 5-9 years. More suggestions can be found in Leland W. Howe, Ph.D., Taking Charge of your Life, Argus Communications, Niles, Illinois, 60648, 1977.

Other activities include:

1. Whose Hands - try to find partner's hands.
2. Taped Mysteries - identifying familiar sounds on tape
3. Listen Without Labeling - listen to inside → outside → as far as possible away from room ⇒ then reverse ⟩ as what is heard.
4. Tasty Turvey - tasting with eyes closed
5. Role-Playing different feelings - use costumes to signify mood changes.
6. Appreciation Circle
7. "What I Like About Myself" Collage
8. Human Machines
9. Mimed Mirrors
10. Pass the ball (book, umbrella, airplane, ice-cream cone, etc.)
11. Relaxation Activities

For the cognitive dimension, please refer to handout #4 for examples of classroom inquiry and group consensus problems that utilize the six areas of cognitive process as described on handout #1. Brainstorming exercises are fun as are brain games which can be found in specific books dedicated to "tickling" the brain. The sky is the limit in programming here, and the teacher can use

the cognitive dimension in conjunction with teaching in a specific academic area such as social studies, language arts, humanities, etc.

Integrative activities of the above-mentioned dimensions which would also demonstrate brain integrative function are dancing/acting-out of multiplication tables, acting out the writing of a paragraph or report, learning a folkdance, multi-sensory imaging, etc.

The students should evaluate what senses are being used in the activities that they do, analyze the connection between sensory processing and learning, assess their individual learning styles, research which particular sensory experiences seem to result in the most efficient learning, and reflect upon how much of ourselves we take for granted.

Possible at home activities in addition to ongoing projects of journals (mind or dream), current events and vocabulary tree, brain drain projects include: tell the class or small group about a memorable sensory experience, memorize and recite a poem you have written, review the five senses with a friend, explain to your parents how the brain is structured to acquire learning ; identify how you learn best; do a report on E.S.P. for BRAIN-DRAIN, dramatize an extrasensory perception happening, practice identifying objects by their smell or feel, apply your knowledge of sensory processing by preparing a classroom teaching lesson, interview a sense, question others as to how they learn best, differentiate between sensory input and learning output, compare your experience of the world to someone else's, compose some questions that you have that have no answers, design some "sense-less" bumper stickers, rate how this unit made you feel.

Days 4 and 5 or Units 4 and 5 - The Art and Science of Perception, or How do we See, Hear, Touch, Smell, and Taste?

This will be a classroom day with a variety of demonstrations and activities. Our guest speaker is Julie, who is blind, and will talk about how she "sees." Another guest demonstrator will be a student, from our class or another, who will do magic tricks.

It is best to start off with vocabulary tree and current events report followed by a review of the preceding three units. Games such as Password, Jeopardy, and Trivial Pursuits constructed by students , parent volunteers, teacher aides are fun and effective ways to interact with and internalize the material. The teacher may also review by following up on the suggested homework activities in the previous units.

There will be a didactic presentation of information which the teacher may wish to include on a student handout.

(1) "More to Vision Than Meets the Eye," Jeanne McDermott, Smithsonian,1985.

a.intimate association of eye and mind, vision more than the process of mechanical recording of reality "just as it is," vision is not a single process.

b."What the Frog's Eye Tells the Frog's Brain," landmark paper published in 1959 by Jerry Lettvin, Humberto Maturana, Warren McCullock, Walter Pitts and M.I.T.

1) certain neurons in the frog's eye (big detectors) respond only to small dark objects moving through the frog's field of vision, neurons don't respond to particular quality of light but register differences in the distribution of light and dark impinging on the retina, each optic neuon telling brain about patterns - not just points of light frog's eye giving frog's brain information about the MEANING of what it is seeing → shows an ability to abstract information

that is built into the eye itself.

c. David Hubel - neurologist at Harvard Medical School and Torsten Wiesel, neurologist at Rockefeller University were among the first to ask how specific brain cells transform all the sensory information it receives.

1) they recorded the electrical activities of cells in monkeys' primary visual cortex; the more they probed, the more complex and specific became the cells' response.

2) all neurons respond to moving lines, but some neurons loved only lines of a given orientation AND some neurons loved only lines of a given orientation in a certain direction - ↗ in 1981 Hubel and Wiesel earned Nobel Prize for their work.

Therefore, what we see depends a great deal on what we <u>think</u> we see; and/or what things mean to us, and how we understand our world.

Perception = Sensory Input + Meaning

d. Roger Sperry-psychologist at Caltech, won Nobel Prize in 1981

1) views brain as a mechanism for transforming sensory patterns' into patterns of motor coordination, the visual system and motor system are deeply intertwined -- "Where you see an object depends on input from almost every joint in the body."

2) the major work of the visual system is NOT to make visual copies of things perceived or imagined BUT rather to prepare the brain to respond to whatever the situation demands.

The students can now discuss their notions about visual perception, how they see, etc. At this point, the student magician can demonstrate that there is "more to vision than meets the eye." You may wish to quote Jerry Andrus, a magician, who asserts that, "You are taken in by magic because you know the way the world works."

And now, on to "The Perceptual World of the Child," from Learning to Use One's Senses, T.G.R. Bower, Harvard University Press, 1977.

Try this on for size: a mother whose 20 years old son was missing-in-action in Vietnam saw a film clip on television where a group of Vietnam soldiers were cleaning a barracks, she recognized the nose way off in the corner of the room as belonging to her son ....Howcum?

a. congenital blindness - seems possible that a complete loss of visual function is caused by a takeover of the "visual" areas of the brain by the other sensory modalities which are receiving sensory input.

b. seems that our perceptual system operates with DISTINCTIVE FEATURES rather than sense-specific items.

c. distinctive features allows the brain to construct accurate perceptions when there is insufficient or incomplete sensory input and/or through other sensory modalities if one (eyes, ears) is "shut down."

* Classroom Demonstration: replication of Ann Pick's experiment to explore concept and mechanics of 'distinctive features.' Please refer to Handout #1, Units 4/5. The experimental findings support the idea that perception does not operate with literal copies of inputs from the world, but rather with abstract distinctive features of the objects itself.

We remember things by choosing those properties of things that do not change. We call these properties that do not change DISTINCTIVE FEATURES. We use language to help us remember DISTINCTIVE FEATURES. We attach a name or label to each separate DISTINCTIVE FEATURE such as vertical, horizontal, curved, diagonal, etc.

f. Principles of Visual Perception, Carolyn Bloome-, NY., Van Nostrand Reinhold Pub. Co., 1976.

1) "seeing" is not a reason for "believing"

2) perceptual processes are not structured to record data, but rather to organize meaning.

3) an event is reconstructed - or remembered - from interwoven relationships with other memories.

4) perception is a series of automatic tentative judgments about probable meaning and relevance as extrapolated from limited data, streamlined for survival.

Pictures should be numbered

Classroom Demonstration - get hold of a collection of optical illusions and present to the class.

g. How We Remember What We See, Ralph Norman Haber, May 1970

1) seems like there is one kind of memory for pictures and another for language

2) recognition of pictures is essentially perfect

Classroom Demonstration - show students 40 different pictures at one second intervals (slides on a projector). Then slip in four new pictures. Have students write down which pictures are new after you show 40 + 4 new slides. Show slide - "#1" - one second-show slide - "#2" - one second etc.

3) recall of detail shows that pictures, faces, and other pictorial material stored in memory as IMAGES

* Classroom Experiment

a. divide class into two equal groups = A and B

b. within separate A and B groups students pair off in teams

c. show a selected picture (for about 60 seconds) to the entire class → in student teams each student draws and describes the picture to the other.

d. Group A plays a game for 30 minutes; Group B thinks about the picture and speaks whatever words come to mind for 30 minutes.

e. Both groups redraw picture (do not reshow picture) from memory

f. Compare Group A and B's pictures, discuss implications - memory is improved with practice and using words and pictures.

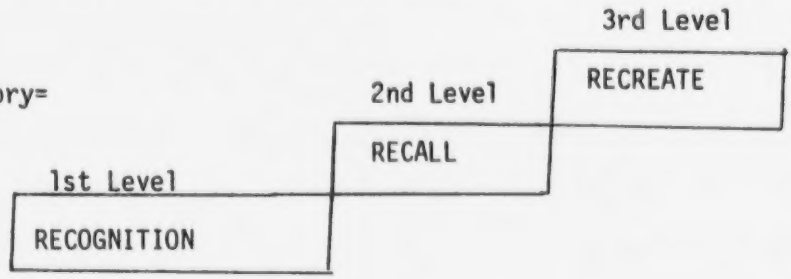
g. Collect all pictures to be placed on exhibit in the classroom.

4) much occurs after the first few milliseconds following the onset of a visual stimulus which needs to be encoded into - or made a part of - verbal memory.

5) the memory process is a system concerned with information processing that consists of its own time constraints for extraction, decay, mode of persistence, susceptibility to interference or erasure.

Please refer to handout on MEMORY PROCESS (#2)

h. 3 Levels of Memory=



*1st Level - being able to match things correctly, eg., you find the word in the story that matches the word printed on the index card.

*2nd Level - being able to remember what something is without helping cues, eg., you are able to point to the word in the story that the teacher asks for

*3rd Level - being able to answer questions that demonstrate an understanding of the material or information presented, eg., you are able to answer the questions at the end of the story without looking back, you can write your own story using the characters developed in the original story, etc.

These concepts will be demonstrated in the following units!

i. Stalking the Mental Image, Stephen M. Kosslyn

1) mental imagery serves as a kind of "mental blackboard" where ideas can be developed and their implications explored

It may be interesting to hear from the class members about their particular brand of mental imagery. This gives clues as to individual styles of sensory and cognitive processing. The students can write about the different forms or manifestations of their mental images followed by a small group exercise where students compare and contrast their mental images. They could also try and duplicate another student's mode of mental imaging.

Related discussion topics include:

1) how is mental imagery related to sensory/cognitive processing, or what does one say about the other?

2) what purpose(s) does mental imagery serve, how does it contribute to or enhance our survival as a species?

3) do you think Stephen Kosslyn's term "mental blackboard" is a good one? What would you use instead of, in addition to, equivalent to?

4) what parts of the brain and the body are involved in mental imaging? Your eyes, visual cortex, memory, etc.

→ Other suggestions: 1) get hold of a mechanical reasoning aptitude test, space relations, geometric forms, i.e., any pen and pencil exercise which will have the students rotating mental images in their head.

2) do some simple math calculations in your head, NO CALCULATORS!, ask studetns how they do it

3) visual imaging exercise - see handout #3 and #4

4) guided fantasy journeys - have the students pretend they are a nerve cell and discuss or write about their travels through the body;

an electron in space; a piece of food being digested; a dust particle, etc.

5) activity books designed for car-trips often have pages of geometric images that must be drawn in a mirror image, this can be done in class.

We conclude with our guest speaker, Julie, who happens to be blind. She will talk about how she "sees": what her mental images are like, how she uses her other senses to sompensate for no vision, how meaning and understanding of events affect her perceptions, etc.

Our class project for this unit will be the administration and analysis of visual and auditory perceptual measures. Please refer to handout packet #5/ Units 4 and 5.

Visual Measures

How we visualize getting to places

1. Ask someone to tell you how to get to a particular destination.

Visual memory of an object.

2. Ask someone to fashion a "critter" out of clay with legs.

Visual closure- reconstructing scene with imited visual input

3. Tape a magazine picture on a piece of cardboard. Place another piece of cardboard with a square cut out over the picture. Ask your someone to tell you what they think is going on.

igure-Ground=ability o detect shapes rom among much isual stimuli r "noise"

4. Ask your someone to find hidden objects in a picture, or words in a word configuration maze.

RACKING

5. Present several mazes challenging your someon to get from one end to another. Let your someone figure out how many snakes there are (contained in handout packet). See how well your someone can follow a pencil, ball, or brightly colored object. Watch the person as they read. Count the number of times they pause (fixate). Ask them to tell you when they are tired of reading.

patial orien- ation, eye-hand oordinating

6. Have someone reproduce a variety of forms with increasing perceptual complexity (Berry's Test of Motor Integration)

Auditory Measures

Memory blending of sounds

1. Sound reproduction
   Sound recognition
   Sound blending

Please refer to boxed in unit on page 1 in handout #5 packet for directions and activity.

recognizing new from old auditory input

2. Auditory Recognition: come up with about 60-80 words, arrange in 5 lists of 20 words each. Be sure that some repeated words from previous lists (1 and 2) appear in later (3-4-5) lists.

   a. Say the word, Subject must answer "+" if has heard before, "-" if hasn't heard before.

sequencing of auditory information

3. Auditory memory (c. retelling a narrative or poetry selection)

   a. play the game where you are having a party and inviting television celebrities, or making a grocery list and buying, etc.; each player must recite what has already been named and then add to the list.

   b. "Concentration" - players name different things in a chosen category (colors, girls' names, flowers, etc.), whoever repeats an item already named is out.

4. Auditory Organization: come up with 20 word-pairs, name off or recite entire list to class, then read first word and see if students can remember its paired associate.

5. Imaging to Auditory Input

   a. play a musical selection, have students draw a design or write a poem

   b. have students draw pictures according to verbally spoken directions

c. have students draw a map according to spoken directions

d. draw pictures while hearing a poetry or narrative reading

Gather classroom and outside data. Compare and contrast, analyze data results. Be sure to exhibit data collections and artifacts somewhere in the classroom. This is another area which could be expanded into an individual or group project for BRAIN-DRAIN.

Other Homework Suggestions and Activities (in addition to current events, vocabulary tree, projects for Brain-Drain).

1. define what perception is -- to you.
2. relate to someone five things you learned about visual and auditory processing or perception.
3. write a guided fantasy journey about a visual or auditory piece of input, what does it see or hear (or feel, smell, taste), put it into a play or dialogue form.
4. consult the Guiness Book of World Records for record-breaking perceptual events.
5. select five quotes form a quote collection source, newspaper, magazines, etc., that describe the essence of perception for you, come up with your own.
6. with some friends devise a Trivial Pursuits, Jeopardy, Password game about perception.
7. explain how you would teach this unit.
8. report on persons with extra sensory perception, what do you think.
9. help set up a resource or learning center on perception to the class.
10. interview persons that are visually or auditorially impaired and find out how they see and hear.

This is the last academic unit preceding field trips and science fair. it involves two components: language and learning how to read.

Unit 6 - "Use It or Lose It"

Unit 7 - What Goes Into Reading?

Let us work our way into this unit by discussing auditory perception and how it relates to language acquisition. Present a brief sketch of the physiology and anatomy of audition; go through the different parts of the ear in addition to sound waves, pitch, timbre, etc. An accompanying handout is recommended. A filmstrip would be fun, and a change of pace.

Today we have a guest speaker who is a research scientist at Weyerhaeuser Corporation. Warren is a specialist in vibration analysis, and will demonstrate a number of audition principles to the class.

Following this is a review of the auditory measures and a discussion about data collection and results. With each auditory measure, make a connection between that auditory decoding process and how it relates to language learning. Sound reproduction, recognition, and blending are important for learning language by imitation. The child is learning the most discrete units of language which are sound through "mimicry", correct discrimination of sounds, and building into more complex units of sounds which are words. Words are the basic units in expressive language. Words are grouped together to form sentences which convey mental thoughts in spoken or written language (reading). Auditory recognition, memory, and sequencing are tied to higher-order linguistic functions such as being able to follow directions, navigate your way to new places, ability to recall auditory input, remembering what comes when and where, etc. Imaging to auditory input takes place in the right half of the brain, and works on building up our repertoire of creative skills and problem-solving. It taps the ability to understand spoken

language, and to individually interpret this input into another sensory form. Language is the link between hearing something, interpreting it, and recreating the input.

By way of review:

5 Senses relay information → Perceptions (Visual, Auditory, etc.) → Auditory inputs are important for language acquisition → Memory is important for language acquistion [3 Levels = recognition, recall, recreate] → a necessary precursor to learning language is IMAGING (or thinking to oneself in terms of language) → language acquisition precedes learning how to READ= a form of learning → intelligence (capacity to learn) ← as a result of learning and sensory experiences
→ creativity (ability to self-ransend)

We are leading into an exercise which will teach us about the acquisition of reading, or will take us back to first grade where we learned how to read our native language, English. We will continue our discussion of language acquisition because being able to speak the language is necessary before being able to learn how to read. What you will find is that reading just kind of happens, it all "clicks," and that we don't learn how to read so much as letting nature take its course. More on this later.

Why does anyone bother to learn language? Well, it starts with PERCEPTION (selecting out distinctive features from sensory input to the brain) + MEMORY (distinctive features are stored categorically here, and can be recalled as needed) + a need or desire or drive to COMMUNICATE results in language-learning. Tonight, at home, observe an infant (sibling, relative, friend, neighbor) as they communicate with you, and you with them. Write down what you observe to answer questions of how do infants communicate without language, and what does beginning or early language acquisition look like?

Today's theme is "Use It or Lose It." You may have heard that you can learn many languages fluently from ages 0-5, and you speak without any kind of an accent. Let's look at Handout #2, Units 6/7, taken from Joseph Chilton Pearce's Magical Child. This is about his four year-old son who demonstrated remarkable musical ability. It appears that we have different learning capacities and stages in our lifetime, some of shich we may lose and some of which we continue to build on throughout a lifetime. It becomes more difficult to learn a foreign language from ages 6 or 7 onwards; but we become increasingly proficient in the use of our first-acquired language (or languages in the case of bilingual parents).

The next activity involves some creative brain-storming about what is a "language organ."

Have the class write down their reactions to a "language organ." Is it alive? man or fowl? Does it taste like liver, etc.? Collect the reactions, and share with the class as appropriate.

This leads into Omni 84's article on "Noam Chomsky: An Interview." Noam Chomsky is a psycholinguist. He emphasizes the role of the mind outlining the unconscious mechanisms that make human speech possible and insisting that a genetically programmed "language organ" in the brain primes the human infant to master his mother tongue. That is, Chomsky is saying that the brain structure plays an important role in shaping language. He also postulates that language development should be called, or looked upon as language growth because the language organ grows like any other body organ. The different linguistic experiences -- such as English vs. Japanese vs. Russian etc. -- modify the language organ's structure. Chomsky also talks about a universal grammar. This is the sum total of all the immutable principles that heredity builds into the language organ. .....We're designed by nature for English, Chinese, and every other possible human language, but we're not designed to learn perfectly usable languages that violate

universal grammar. These languages would simply not be within our range of abilities...."

What the language organ implies is that the brain is structurally organized (i.e. placement of neural cells) to acquire language just as the brain is also made or designed to receive and process sensory input which results in learning. The idea of a universal grammar or innate program for language organization also implies that language is structurally organized in the brain according to a genetic blueprint received at birth. We as earthlings couldn't acquire Martian language because our sensory processing modes would be unable to receive and interpret the Martian linguistic input.

Thus, the language organ refers to the areas in the brain involved with language growth and development. The universal grammar contained in the brain tells of all the linguistic experiences possible for acquiring a human language. Our specific language experiences modifies the language organ so that the language organ develops to acquire a specific language such as English or Chinese.

Remember, the motive for language acquisition is a NEED to communicate. This, in turn, facilitates learning.

And now, on to a sampling of foreign languages.....

This part of the lesson will start out with an exercise in deciphering and wordness. Sample handouts are included (Handouts #3,4,5/Units 6 & 7), but be encouraged to collect and design your own.

The first handout should contain a passage that is indecipherable to a native English-speaking classroom. The one included is in Korean; however, languages such as Chinese, Russian, Arabic, or Hebrew would also do nicely. Ask the students if they can understand any part of the text at all. Why

or why not? Introduce the concept of "wordness" as being a key ingredient to deciphering spoken and written language.

The next handout is a Polish text. Again, languages such as German, Portuguese, Check, Danish, or Hawaiian would suffice. Ask the students if they can hazard some guesses as to what the text is about. Ask them to describe their reasoning processes outloud, i.e., deciphering attack strategies. Point out the presence of wordness and how it relates deciphering.

The last handout contains a nonsense language paragraph with comprehension quetions following. Make up your own collection, it's fun!

Example: The smootz bilked just as the iddy theezled down the outchpas. The outchpas had no reebox, and thus could not theezle the iddy. Fortunately the outchpas knew how to bilk, and this made the smootz very happy.

1. Who theezled down the outchpas?
2. How come the outchpas couldn't theezle the iddy?
3. What made the smootz very happy?
4. Draw illustrations for: a smootz bilking, the outchpas' reebox, a happy smootz, an iddy theezling down an outchpas.

Have the class complete the exercise. As follow-up activities just prior to class discussion of what these exercises all entailed, ask the students to:
1) design their own nonsense stories and questions AND/OR
2) in small groups of 3 or 4, devise a secret language or code, then write a story or dialogue or poem to be shared with the class:

Now have the students react to, and discuss, what was involved in deciphering an unknown or unfamiliar language. Some points to be included:

1. visual and auditory perception or seeing and hearing language
2. a desire to communicate and understand sensory input
3. symbols are linked with meaning

4. symbols are recognized by matching old stored inputs with new inputs

5. symbols are stored in memory as a result of recognition, having a meaning and being rehearsed

6. use of past experience to construct meaning when not enough information is available or to generate new meaning

7. above experinces and activities constitute learning whose key components are intelligence and creativity, and result in a new creation such as a story or poem or dialogue

Communication involves all facets of our sensory being and processing equipment. It is more than just talking or listening. Suggested learning activities: charades, improvisations, mimes AND/OR We are on a class trip to China. How could we, or would we, strategize to find out which bus to take to our hotel, get directions to a museum, order dinner in a restaurant, buy a postage stamp, find out what time the zoo closes, etc.?

We have now returned from our class trip to China. Our next adventure in language is to see a 10-15 minute short film all in French, and then try to decipher it. How do we do it? The use of contextual cues + our past experience + making predi-tions about the outcome, and constructing hypotheses based on the probability that an event did occur or failed to occur.

Time for a quick break and diversion. We have seen the importance of being able to identify "wordness" to enact decoding strategies with unfamiliar material. Let's do the following exercise. The teacher will pass out a page with 5-10 lines of 5 similar words each. Example:

1.	spoke	speaking	spotted	slovenly	spacey	
2.	book	boyish	beauty	bullit	bloated	
3.	lovely	lakeside	lumpy	liltingly	locksmith	ETC.

The students should have another sheet to cover up the page. The teacher flashes a word from Line 1 on an overhead projector for a second, and students circle the word they saw. Continue on with the other lines having students reveal successive lines to themselves after the word is flashed before them.

This word recognition exercise demonstrates that it is 100% accurate with a single second viewing rate. Matching a recent iconic image is very strong. This task becomes more difficult, and less accurate, with time delays between viewing and matching and with more complex stimuli that requires more encoding.

Now pass out a difficult text in pose or poetry (Shakespeare, the Bible, Wall Street Journal, Locke, Einstein's Theory of Relativity, etc.), and have students take turns reading aloud. Discuss their feelings and reactions to reading material that makes no sense to them. Does it encourage independent reading, or cultivate an enjoyment for reading?

Everyone take a breather, you've earned it! Break is over, and thinking caps are replaced....What Goes Into Reading? List class answers on the board.

Some ideas:

- recognize symbols
- attach meaning
- discriminate one symbol from another
- sequence symbols
- distinguish visual and auditory features of symbols and sounds
- process visual information
- have language
- tracking
- pay attention
- desire to read
- sustain input
- iconic image → STM → LTM
- share what you remember
- bring in past experiences

Out come our reading texts, "Qu 'est-ce qu 'on dit, mon petit" (What do you say my dear?). You have got to be kidding. No, quite seriously, let's experience learning how to read. Pronunciation doesn't matter. Concentrate on

being able to match words, connect a meaning, use words as meaninful symbols kind of like our nonsense language and secret codes. Let's break the code.

Ask for a simple sentence. I have a book. On a poster board, I write, I have a book. } Students are asked to use whatever memory
J' ai un livre. } Strategy will help them associate the word configuration "livre" with the meaning of book. They can draw a picture, mentally image, get a specific smell or taste sensation, use a color association, pneumonic device etc. Ask them to record memory or associational tactic on 3 x 5 cards on their desks, or at their disposal.

Let's continue and make up a simple story. I pick out vocabulary words in each sentence. Students record how they will remember the French word and the English meaning. Tell students to save all their cards. You may wish to discover how different students decide how to remember something, and share this with the class.

The students have had a chance to experience a foreign language. Time to intorduce Heidi, a polylinguist (German, French, Spanish, English), who will talk about how she experienced learning several languages, how she keeps them straight, problems or eccentricities, any confusion, how she experiences communicating in each separate language and overall, etc. Go, Heidi, go!

The class has experienced translating spoken language (English sentences rewritten in French) into a written form, and doing interim meaning, association things that will help them to remember what the French word means. They have their 3 x 5 index cards on file with their pictures or other memory-meaning association tactic.

Let's practice a bit. I write a French vocabulary word from our class made-up story on the board, and ask the students to hold up the card with the memory-meaing association tactic (usually a picture). We repeat this exercise with remaining vocabulary words. Then, I hold up a picture AND students must respond outloud while simultaneously writing word on a 3 x 5 card. This is repeated. Now, alternate with French word stimulus picture response AND picture stimulus French word response.

Now, focus attention on either a book of simple stories, or a simple story handout. Time for the first step of memory or word-recognition. Have students go through the story and circle vocabulary word #1, then #2 in a different color or underlined, #3 in boxes or another color, etc. The next task is memory step #2 or word-recall. Have students match their pictures to the printed words and say the meaning outlined (softly to themselves). The last step in memory is to recreate, or to apply the meaning of words in understanding the written story...i.e., reading.

We will continue with the meaning approach, and will try to deduce as much of the storyline from non-reading strategies, or use of context and general knowledge dereived from our experience repetoire. Look at the sequence of pictures. What are they saying or implying about the story action? Can we deduce a general meaning or idea of what the story is about? The teacher then asks "shaping questions" which engage the students in predicting outcomes.

Now, have the class read the first paragraph (or more) in French silently. Tell them to sound out words phonetically. Remember, pronunciation doesn't matter; trying to link a word with a meaning, or deriving a general understanding of the printed material is. Have them use their word matching and picture meaning tools (3 x 5 cards) to help them translate the words, and let them construct the

general meaning based upon what we have established in class discussion as possible/probable story action and their individual understanding of the printed text as they read it. Continue until the story's action has been unlocked.

Try to stress the elements that are part of reading acquisition: wordness, word recognition, language, imagery, meaning, memory. Also, that reading is a "language thing."

The teacher can stop here, or build upon this exercise. That is, students can continue to translate French stories into English meaning. They may wish to do partial translations of English stories into French including text pictures to aid in cracking the meaning mystery. Students can write their own story sequels using French and English, or write their own French/English stories on their own. If more difficult stories are introduced, the approach remains the same. Familiar words are sighted first and quickly reviewed for meaning. The new words are selected out and meaning pictures are made. The students practice word recognition and meaning matching with new words. They attempt to deduce the general meaning of the story prior to reading. They then read the story to confirm or deny their initial hypothesis. As students build their vocabulary and reading fluency, there will be less reliance on the 3 x 5 index card method which represent initial reading acquisition strategies.

Students should have an appreciation of what goes into reading acquisition after this. They should have alternative strategies to the approach of tackling very difficult printed materials and/or a foreign language.

No homework assignments tonight. Tomorrow is a field trip day, and the next day is our final day in this unit culminating in....

BRAIN DRAIN

Today is Day #7, or Unit #7. Field Research Day. In other words, let's go do it! In the morning, school buses will transport students from school to the Pacific Science Center. They will participate in the demonstrations and view the exhibits, and will be asked later on to tell or write about an exhibit that impressed them or imparted new learning to them. It just so happens that the major feature as P.S.C. is an entire exhibit on "Creativity" including a large computer display.

The students will have an opportunity to integrate the material that has been presented to them as they view real-life applications of the concepts and activities that have been taking place in the classroom. This activity will serve an enrichment function in having the students interact with a diversity of sophisticated materials that surpass what is possible within the confines of a classroom. It exposes the students to centers of learning exploration and adventuring in their community. Each student is afforded a personalized learning experience as they proceed through the exhibits at their own pace. Field trips are always exciting and stand out as a signigicant event in our memories of school.

After a picnic lunch at Seattle Center, the students are transported to the Federal Way Convalescent Home located on south 310th Street and 14th Avenue South. The students have been broken into teams. They have already prepared a list of interview questions, and decided how they will operate as an interviewing team. They will be encouraged to do adquate preparation so as to reduce anxiety, but to also "play things by ear" and allow the interviews to spontaneously transpire. That evening, student teams will prepare a "scholarly journal" article based upon their field research. The articles will then be "reprinted with permission" and compiled in ur class' Journal of Learning. One student

team is assigned to interview a retirement home resident. Interviewing and recording tasks are split up, alternated, etc., as appropriate to particular team functioning.

The activity accomplishes several functions simultaneously: the students will act as participant observer researchers, chance to apply classroom knowledge to "real life," the retirement home residents and students enact a reciprocal learning situation as they exchange world views and perceptual filters.

After our visit here, the bus takes us all back to school where students are picked up by their parents.

Day #8 or Unit #8 - Brain Drain Fair AND Pizza Party. This activity will be the highlight of all of our coursework, and is the classroom's longer-termed goal to organize and plan for. It teaches the student about short vs. long-termed goals, and how to structure activities to achieve goals. The student will have a wider field in which to interact with the conceptual material presented, and to formulate concrete applications in individual and small group projects. The fair will provide a forum whereby the students can display their work, receive feedback, derive a sense of accomplishment, and take pride in their work. The fair will also involve people from the community which will hopefully help to establish future paths of communication and a cooperative school-community working relationship.

Today we turn the classroom into a physical and colorful manifestation of our course, "Mind Adventuring." The students know their final projects are due today as well as their course/instructor/self evaluations. It is hoped that a core of parent volunteers will be on hand to help with setting up the fair in addition to any community persons such as local business and professional representatives who wish to participate. Important to note is that student

exhibitors, parent volunteers , teachers/teacher-aides, and community persons will be subject to the student executive committee responsible for planning and coordinating the fair.

On display will be the students' journals organized around the theme of personalized mind-adventuring, individualized learning profiles, and our class' literary magazine, "Reflections." The specific exhibits, demonstrations, learning centers will represent the students' small group projects. Possibilities include a bulletin board that illustrates the course theme of learning and the mind, a mural about creativity and intelligence, a videotape about language and reading acquisition, a photography exhibit, learning "fun" centers which demonstrate perceptual measures/optical illusions/relaxation techniques/ Ann Pick's distinctive features experiment, etc., kinesthetic learning such as dancing out the multiplication tables or reinacting Einstein's theory of relativity, learning "how to _____." There will be an in-class library that will house individual students' research and report projects.

Let this be a climax for the class. Ride the waves of excitement and intensity. Let the entire day simply happen. Don't forget the pizza party.

ENJOY!